Recovery of Benthic Macroinvertebrate Communities in the Medina River and N. Prong Medina River Following a Historic Flood

Lauren Pulliam, Bill Harrison, Ed Ragsdale,
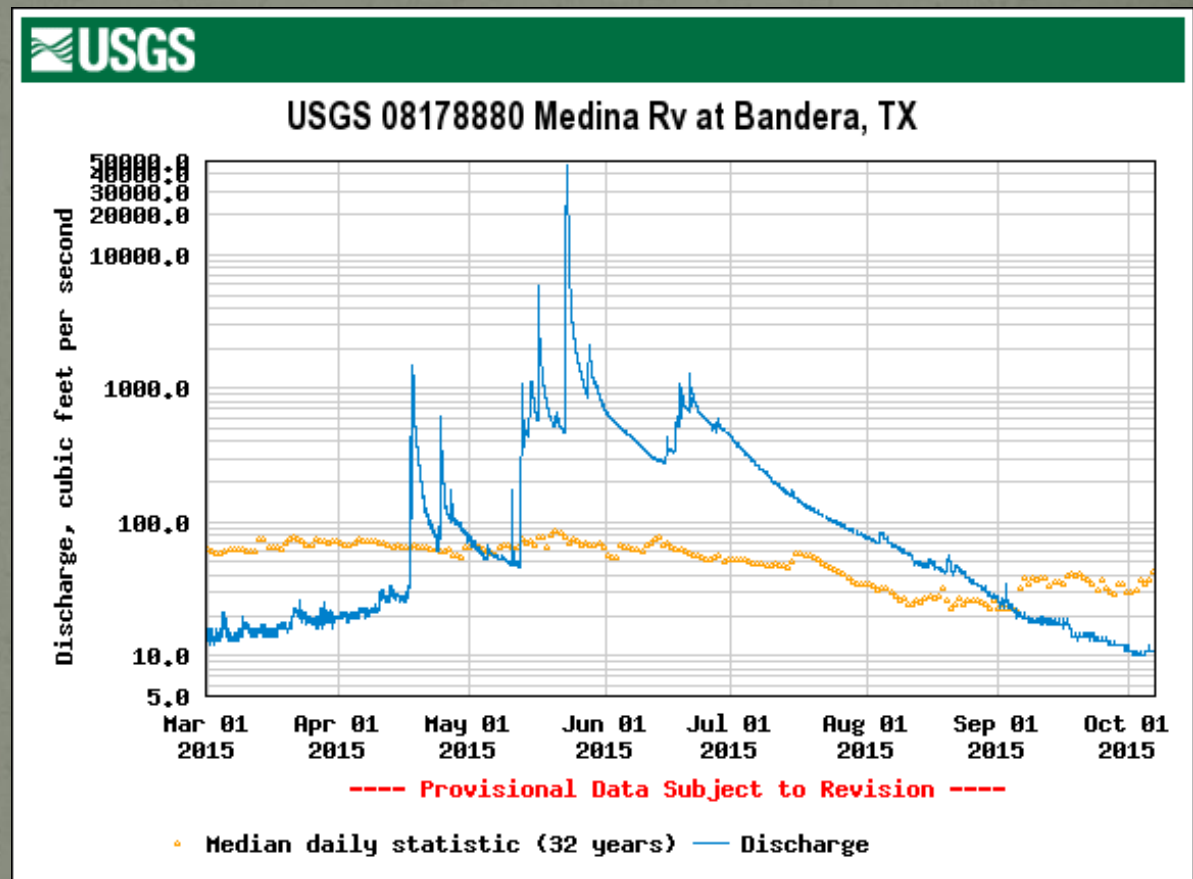Sarah Whitley, Gordon Linam

Medina River, June 4, 2015   Medina River, September 10, 2015

# Flooding in the Medina River

- In late May Medina River in Bandera reached ~25 feet (fourth highest)

- Peak ~46,700 cfs

- Historic crests (over flood stage of 13 ft) recorded by NWS in 1978, 1985, 1987, 1992, 1997, 2002, 2007 and 2015

USGS 08178880 Medina Rv at Bandera, TX

---- Provisional Data Subject to Revision ----

• Median daily statistic (32 years) —— Discharge

High water
mark ~42 m

Medina River Status

- N. Prong Medina River (1905A)
  - Least Disturbed Stream
  - ALU Presumption: "High"
- Medina River (1905)
  - Fish impairment
  - PHAB concern
  - ALU Designation: "Exceptional"
- ALM scheduled in May
- Post flood reconnaissance

Station 18447 N. Prong Medina River @ SH 16

Station 21631 Medina River @ Mayan Ranch
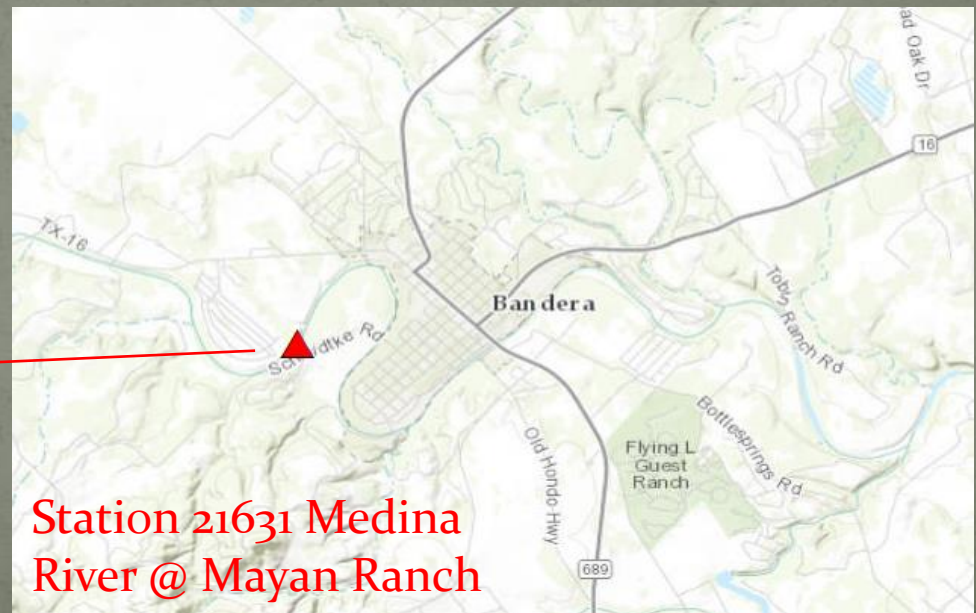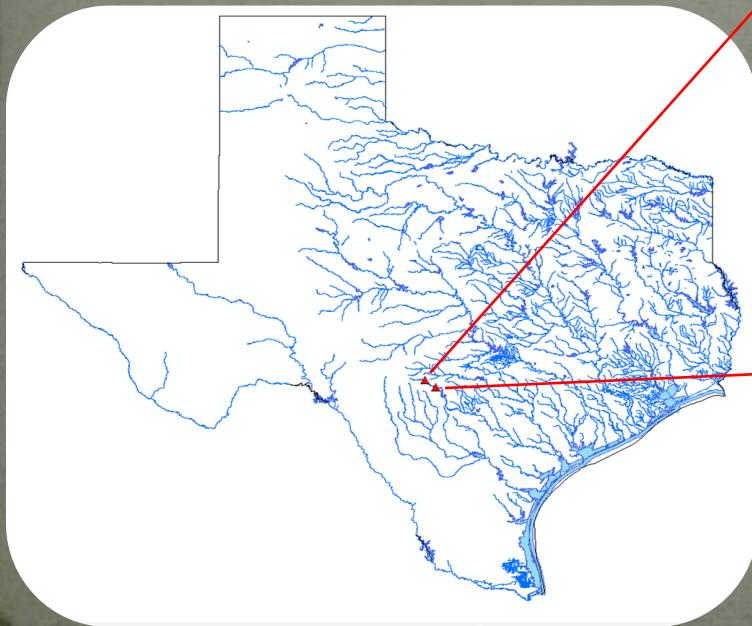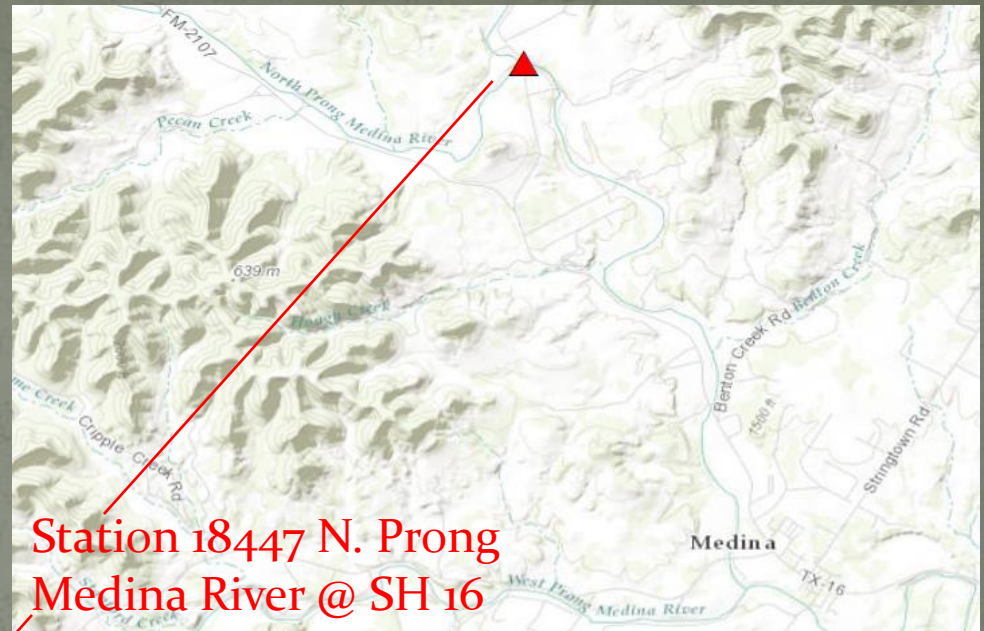
Flooding impacts on benthic macroinvertebrates

- Recovery dependent on flood severity, life history of organisms
  - Weeks to years
- Low resistance to scouring events
- High resilience

- Life history characteristics
  - Short generation times allow rapid recolonization
  - Synchronization of emergence

Flood Recovery/Guidance in Other States

- Fisher et al. 1982 (Arizona):
  - "…the biota recovered in 2-3 weeks"
- Mundahl and Hunt 2011 (Minnesota):
  - "Taxa richness and community structure returned to pre-flood levels …within one year, but total densities remained below long-term averages 22 months post-flood"
- Kentucky DEP:
  - "benthic macroinvertebrate samples should not be collected during periods of excessively high or low flows or within two weeks of a known scouring flow event"

- Fisher, S. G., L. J. Gray, N B. Grimm, and D. E. Busch. 1982. Temporal succession in a desert stream ecosystem following flash flooding. Ecological monographs.
- Mundahl, N.D. and A. M. Hunt. 2011. Recovery of stream invertebrates after catastrophic flooding in southeastern Minnesota, USA, Journal of Freshwater Ecology.
- Kentucky Division of Water . 2015. Methods for Sampling Benthic Macroinvertebrate Communities in Wadeable Waters. Kentucky Department for Environmental Protection, Division of Water, Frankfort, Kentucky.

SWQM Procedures Manual Vol. 2 Guidance

- Collect biological samples during "stable, unscoured flow conditions"

- Significant scouring events: biological samples should be collected after a minimum of two weeks of normal flow

- Extreme weather conditions: one month of normal flow

Methodology

- 1-3 samples per month
  - 5 min. kicknet (2 reps)
  - Temperature, conductivity, dissolved oxygen, pH
  - Flow
    - N. Prong – instantaneous
    - Medina – USGS gage
  - Stream velocity and depth (10 points in riffle)
  - Riffle length/width
  - Algae estimate (18 points in riffle)
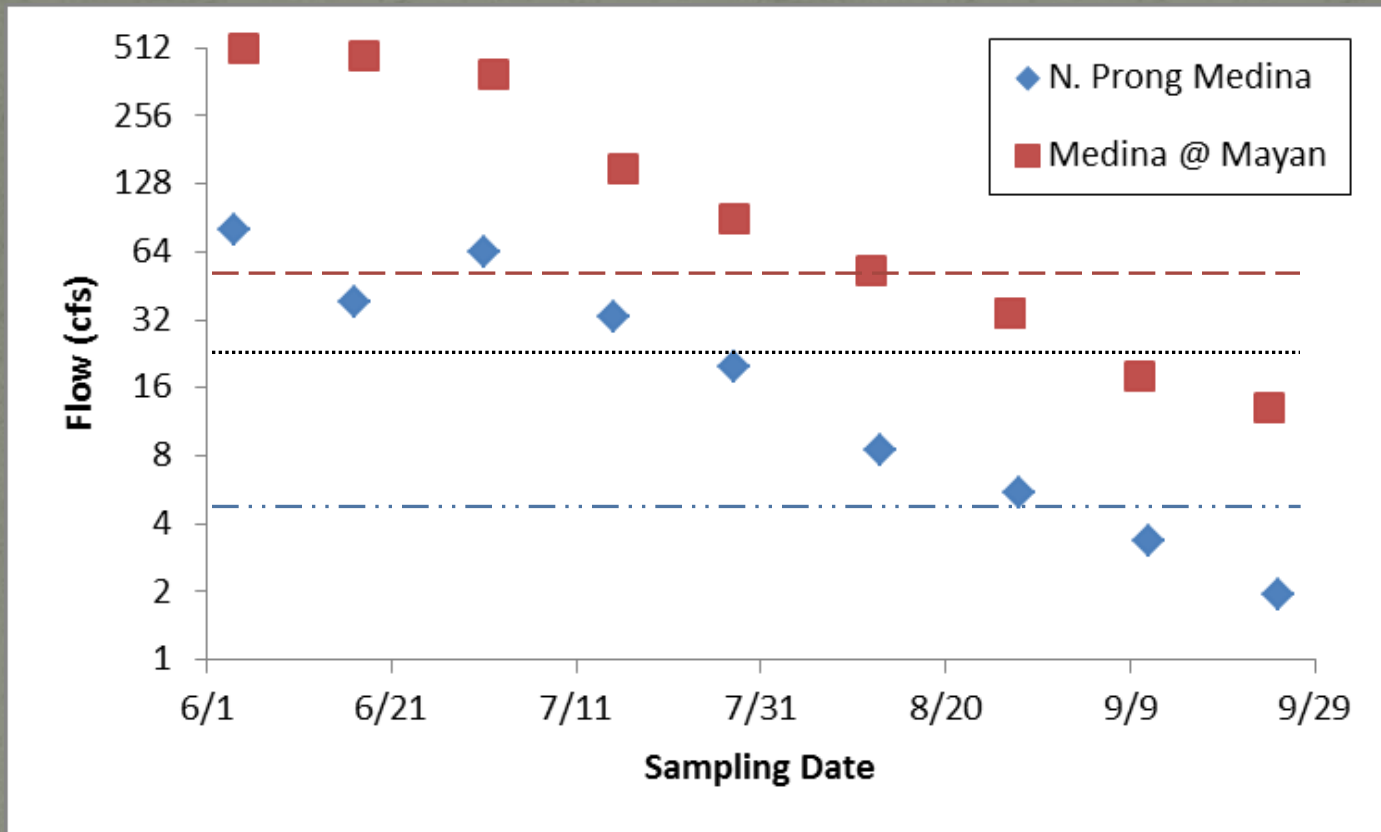   - Moss cover, macroalgae cover, microalgae thickness

V1	V2	V3	↑ upstream
	V4	V5	
	V6	V7	
V8	V9	V10	↓ downstream
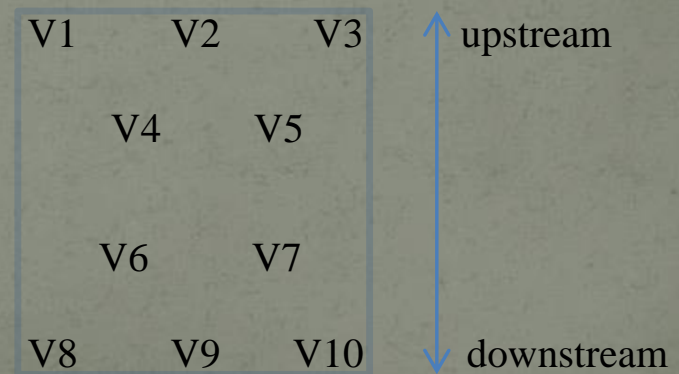
Changes in Water Temperature and Conductivity
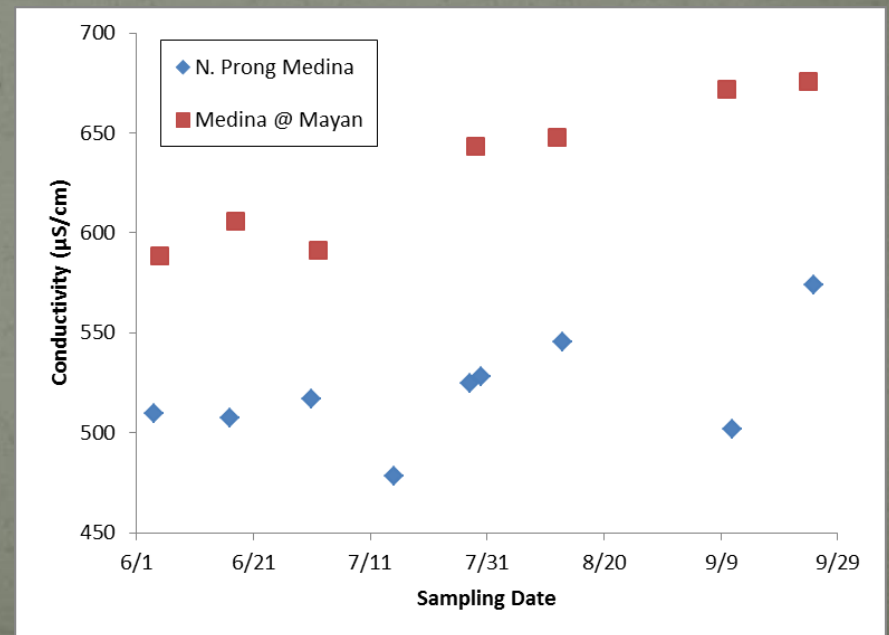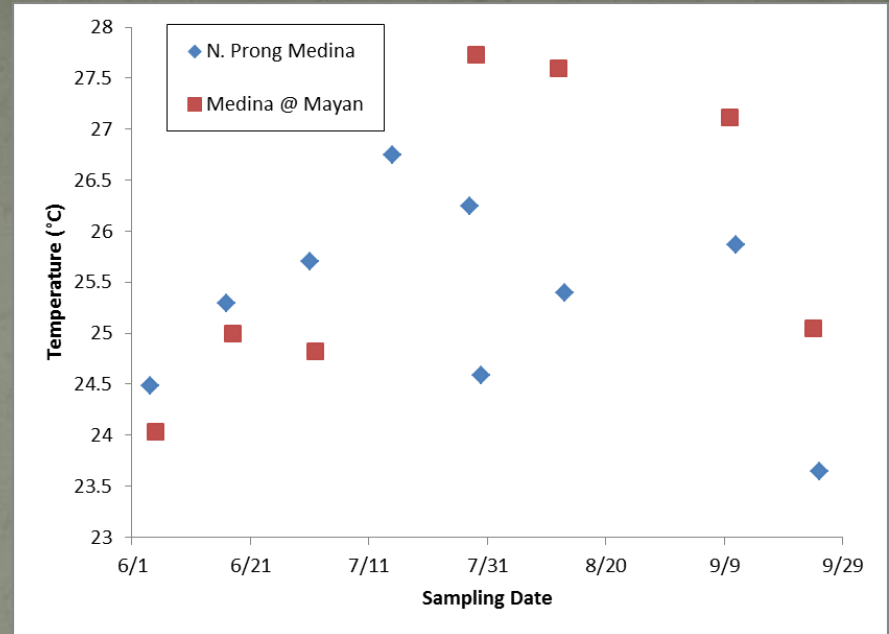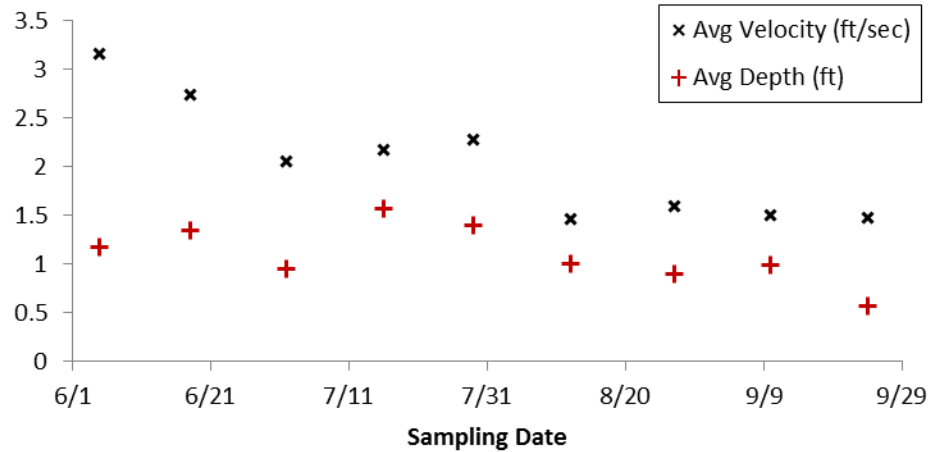
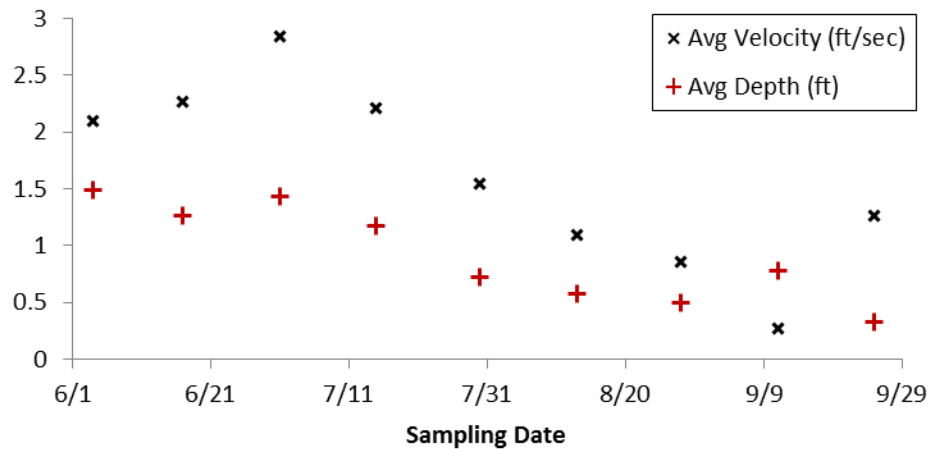# Changes in pH and Dissolved Oxygen
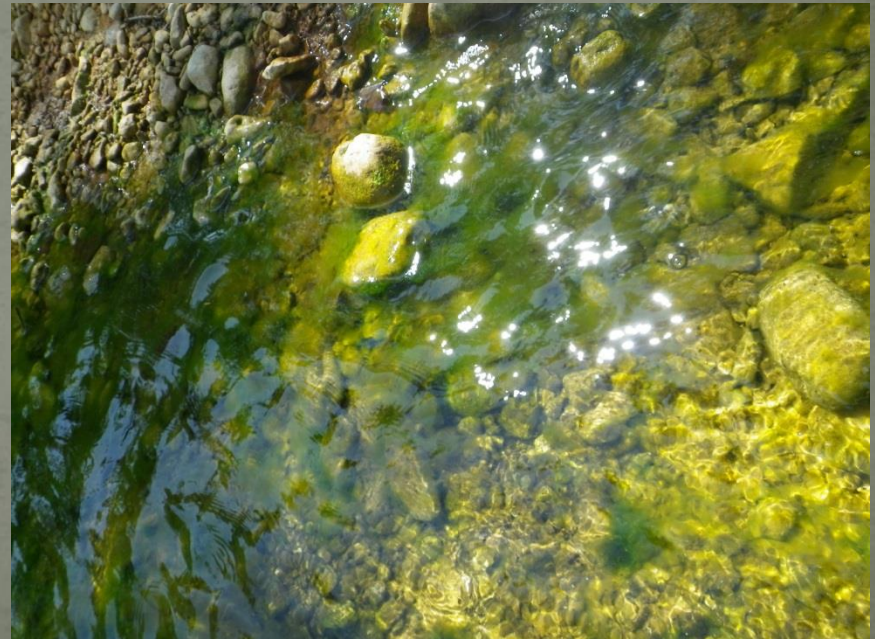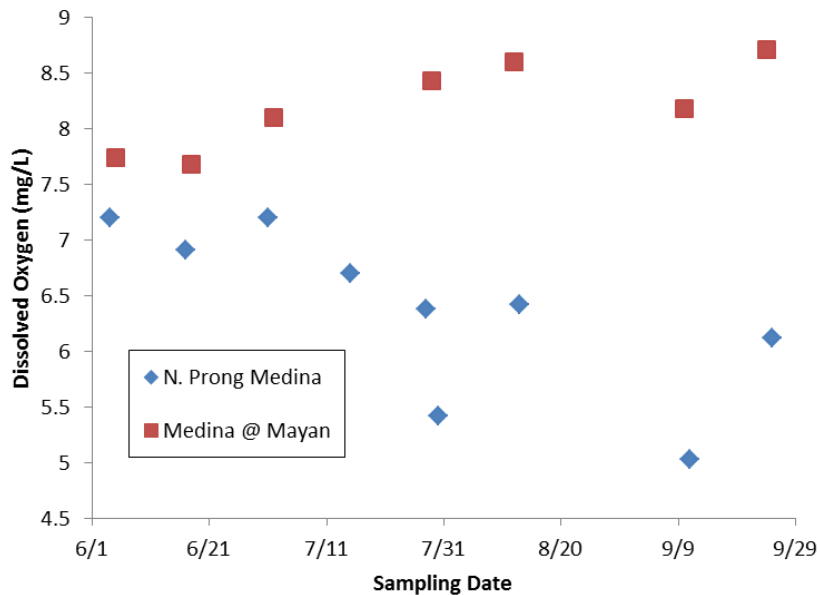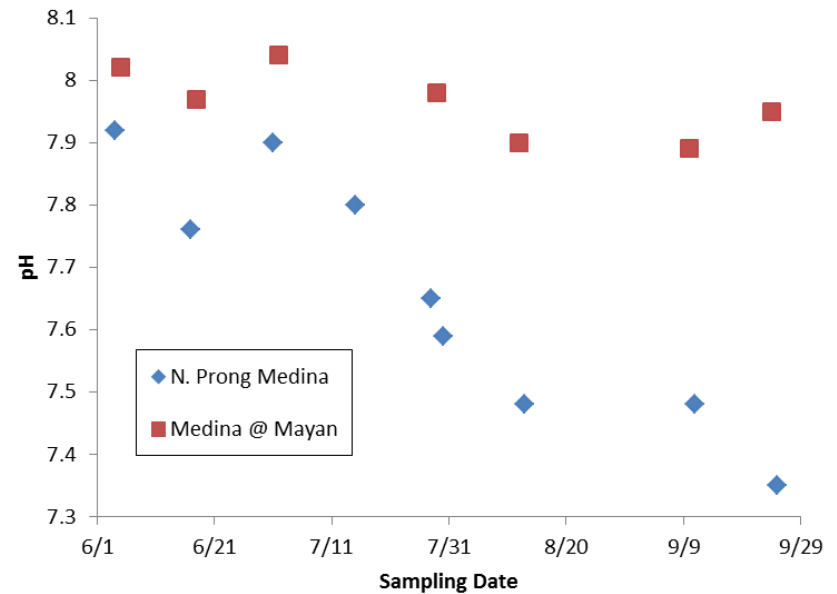
Flow Measurements

.... 7Q2 Medina River @ Old English Crossing Station 12830 (25 cfs)

— — — Medina River@ Bandera USGS gage (32 year median= 55 cfs)

—·—·— N. Prong Medina Station 18447 (7 year median= 4.8 cfs)

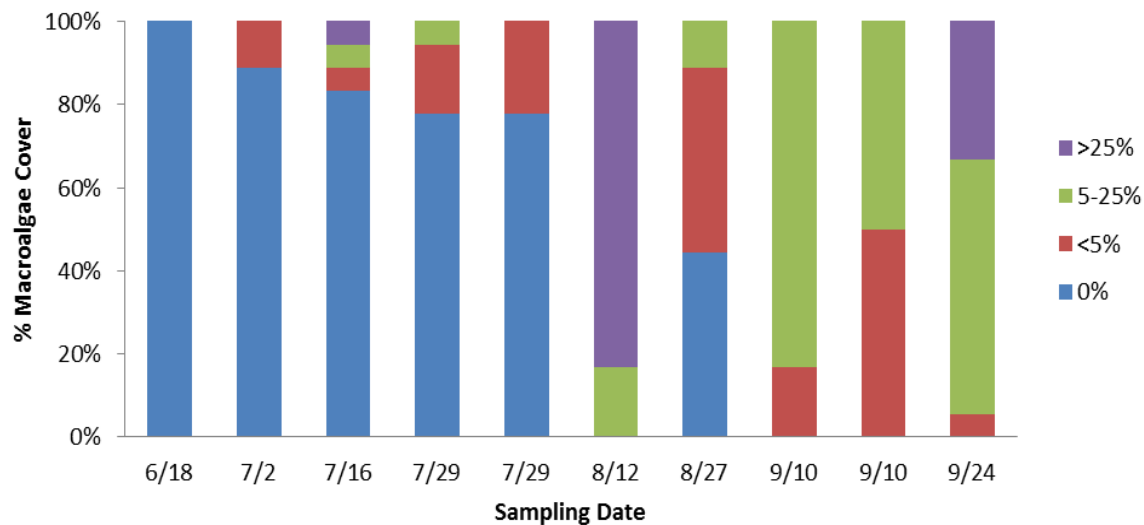# Velocity/Depth Measurements
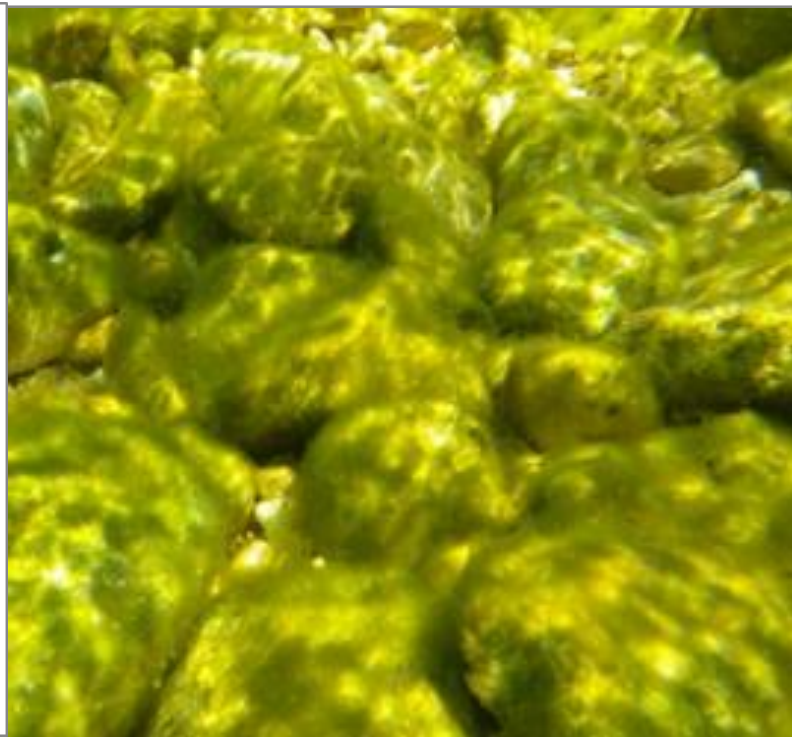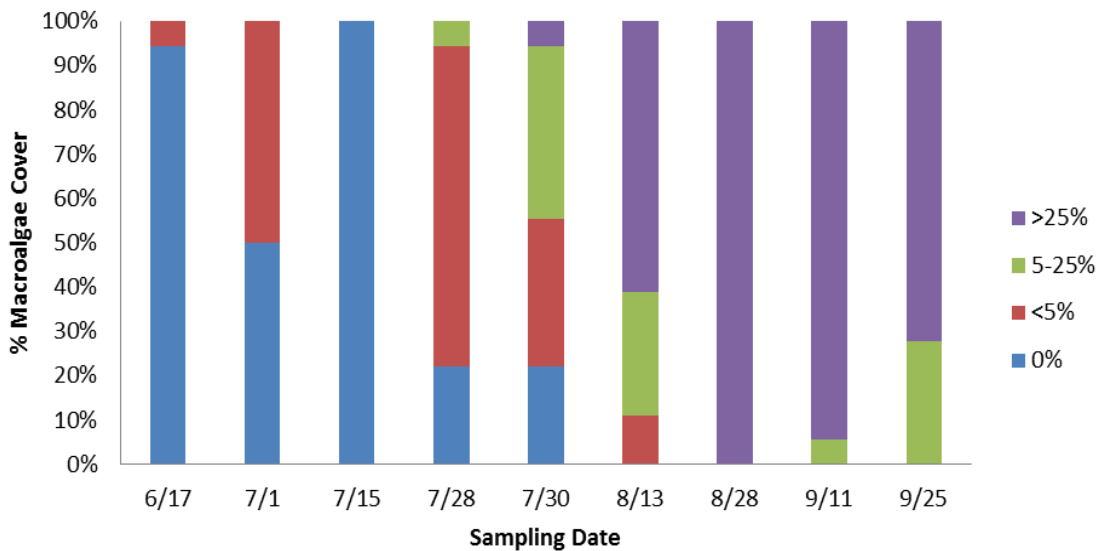

Medina @ Mayan

N. Prong Medina
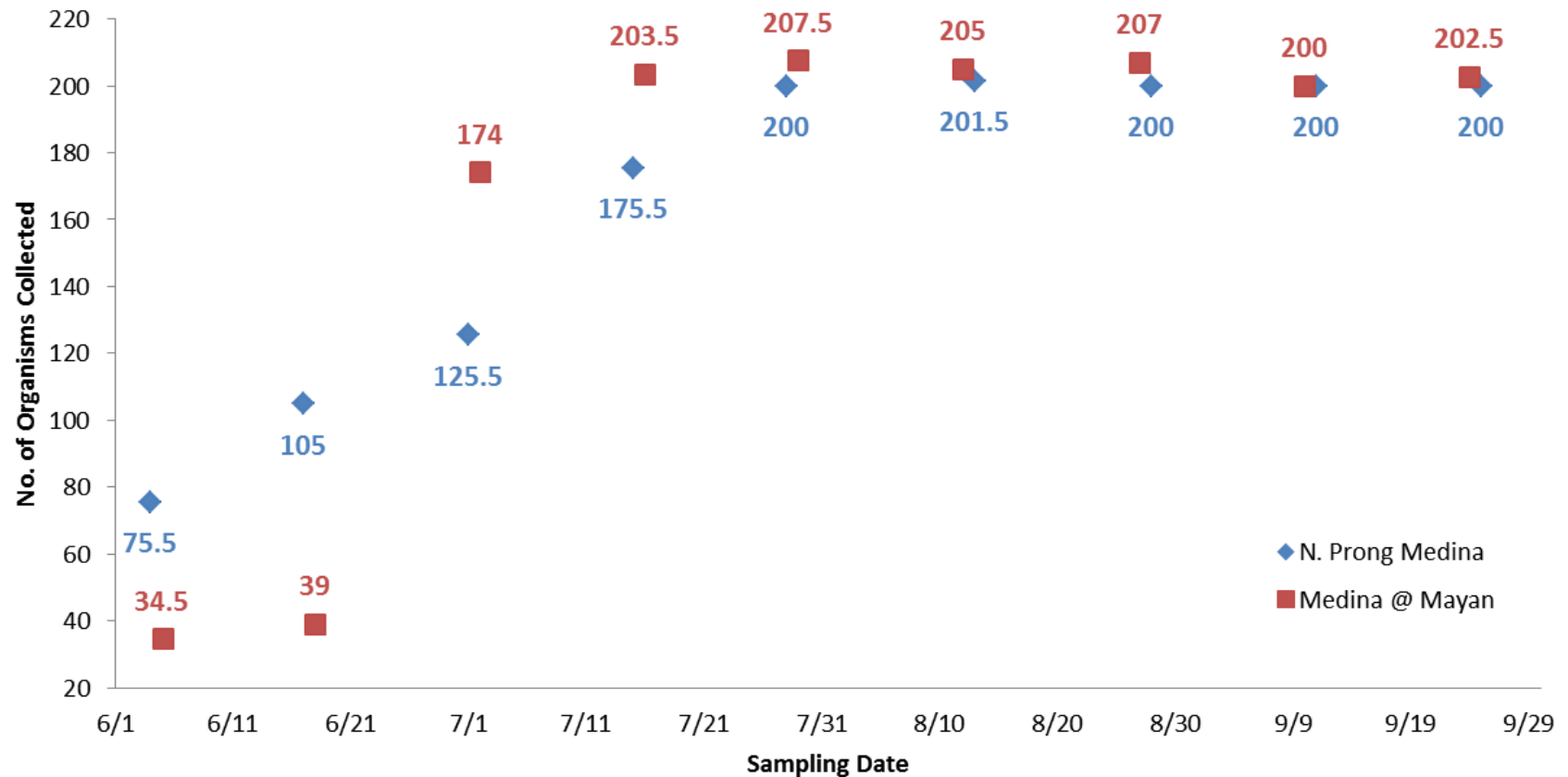
Medina @ Mayan
Percent Macroalgae Cover

Legend:
- >25% (purple)
- 5-25% (green)
- <5% (red)
- 0% (blue)

Y-axis: % Macroalgae Cover
X-axis: Sampling Date — 6/18, 7/2, 7/16, 7/29, 7/29, 8/12, 8/27, 9/10, 9/10, 9/24

N. Prong Medina
Percent Macroalgae Cover

Legend:
- >25% (purple)
- 5-25% (green)
- <5% (red)
- 0% (blue)

Y-axis: % Macroalgae Cover
X-axis: Sampling Date — 6/17, 7/1, 7/15, 7/28, 7/30, 8/13, 8/28, 9/11, 9/25

Kicknet Sample Counts

Average Number of Benthic Organisms Collected

Target: 175 ± 20% (140-210) individuals
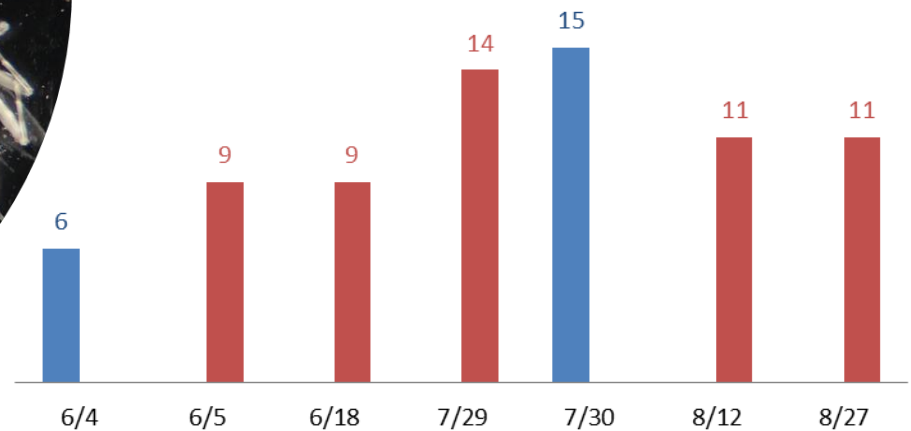
Benthic Macroinvertebrate Metrics: Preliminary Results

Benthic Macroinvertebrates: Preliminary Results

Aquatic Life Use Category	Statewide	ER 30
Exceptional	>36	>35
High	29-36	31 - 35
Intermediate	22-28	25 - 30
Limited	<22	<25

Medina @ Mayan IBI Scores
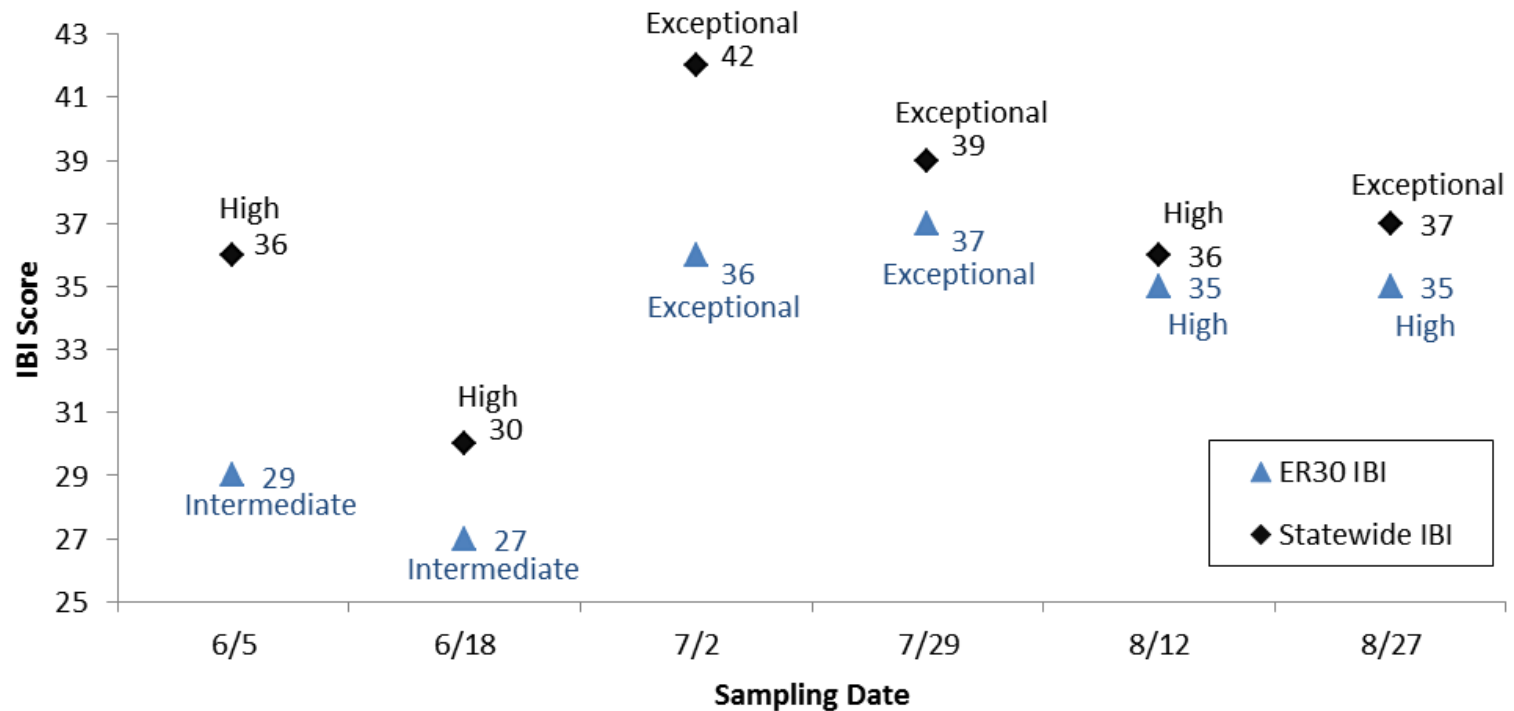
N. Prong Medina Preliminary Results

Scatterplot of ER 30 BIBI Score vs Date
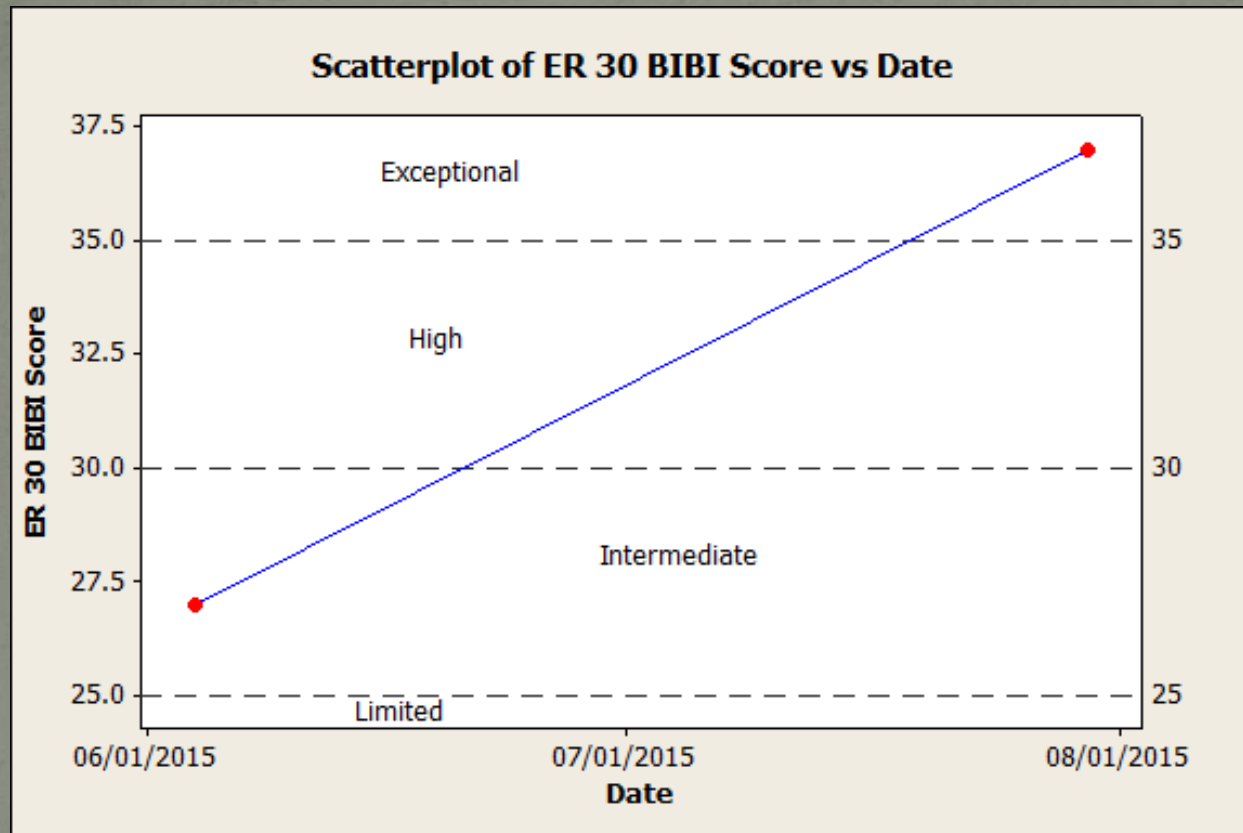
Observations

- 6-7 weeks to collect sufficient number of individuals (175 ±20%)
- Regional IBI appears to reflect disturbance better than statewide IBI
- Recovery dependent on magnitude of flood event, aerial recolonization, life histories (development time), and presence/utilization of refugia during high flows
- Additional sample processing necessary

Questions?